

COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

Weekly Newspaper Second-class postage paid at Boston, Mass.

Vol. III No. 6

February 12, 1969

Price: \$9/yr



The Road-Savers

A computer is helping these University of Alaska engineers to find ways to prevent winter's repeated freezes and thaws from turning roads into washboards. Story on page 8.

CDC Tells Why It Bans Nonapproved Disk Packs

Special to Computerworld

MINNEAPOLIS, Minn. — Control Data Corp. removes its warranty from its disk drives when they are used with nonapproved packs, a CDC spokesman told *Computerworld* this week. At present, only IBM and CDC packs are approved, he said.

It is not CDC's policy to issue specifications on its drives, he said, but he acknowledged that they operate on loose tolerances than the IBM 2311 disk drives. He also said that CDC was quite prepared to evaluate other manufacturers' packs "provided that they would pay the costs." He estimated the cost upwards of \$25,000.

The Control Data policy has resulted in one of Control Data's customers, International Computers, Ltd. in England, increasing maintenance prices by 50% on

drives with nonapproved packs (CW, Jan. 27).

Quality Control Problem

The CDC spokesman agreed that many other disk manufacturers probably do produce packs of good quality, but he said that the question was one of quality control. "To insure that pack manufacturers produce goods of consistent quality would require a lengthy evaluation process. Cost of evaluation in these circumstances would probably range upward of \$25,000-\$30,000."

He explained that Control Data would not accept responsibility for drives using nonapproved packs because bad packs "can smash heads at a cost of \$250 each." Ten heads per drive add up to \$2,500, he said.

Control Data drives are used extensively with non-Control Data equipment.

First CDC 7600 Shipped to Livermore

Special to Computerworld

CHIPPEWA FALLS, Wis. — The first Control Data 7600 computer has been shipped to Lawrence Radiation Laboratory, Livermore, Calif., operated by University of California for United States Atomic Commission.

600, announced Dec. 3,

1968, as the world's most powerful, features virtually unlimited input/output capabilities. Data storage capacity includes two internal, high-speed magnetic core memories of 650,000 and 5 million characters. With internal speeds of 27.5 nanoseconds per word, data can be transferred between core

2nd 'Software' Patent Granted Despite Ban

LOS ANGELES — The U.S. Patent Office apparently has, in effect, granted another software patent despite its guidelines which state computer programs cannot be patented.

The patent went to David E. Ferguson, president of Programatics, Inc., for a method of increasing the usefulness of computer operation codes.

While the Patent Office granted the patent on the basis that the invention included both software and hardware embodiments, Ferguson contends that the patent covers the implementation of his invention by any hardware or by any program. Therefore, he said, it is a software patent. He also says that any software infringement will be vigorously prosecuted.

His method came out of the development of an interpretive assembly program for the Scientific Data Systems Model 92 computer in 1965. It can handle both interpretive language and hardware-code interpretation, he said.

Operation Codes Wasted

The invention is based on the

fact that many codes are used only after certain other codes. In particular, the operation codes that are used immediately after an input/output oriented instruction, such as LOAD, are different from those which are used after a branch instruction such as GO TO. Ferguson, therefore, realized that the same instruction code can be given different meanings depending on what has gone before it.

Different States

He therefore postulated a number of states for the computer, one of which was entered when an instruction like LOAD was given and another when an instruction like GO TO was given. Within each state, the meaning of certain instruction codes depended on status indicators.

"It was a great success. With this, we were able to reduce the operation codes to only 3 out of 12 bits. We were able to increase the addressing so that we could address a large memory using 7 bits for the indirect addresses to a table. We were able to create a compiler in only 4K bytes. Ferguson told *Computerworld*.

The potential importance of the patent, according to the company, is probably in increasing the effective capacity of small-word size computers. With the increasing popularity of these computers, and the attendant addressability problems, this technique offers an attractive method for reducing the number of bits needed to represent command codes, thereby allowing larger address fields," he said.

FCC Permits Users to Share Lines

WASHINGTON, D.C. — Users may now share their leased telephone lines and the cost of them — with other users.

Despite a complaint from Western Union that the new tariff

would allow users to reell the use of their lines in competition with Western Union services, the Federal Communications Commission allowed the tariff to go into effect Feb. 1.

IBM Executive Warns

4th Generation May Be Incompatible

Exclusive to Computerworld

NEW YORK — IBM's fourth generation systems may be program incompatible with System 360, IBM employees were told recently by an IBM vice president, G.B. Bietzel. Bietzel, who also is an assistant general manager of the Data Processing Group, said in an interview that IBM would not hesitate to ask the data processing community to "reset-to-zero" and accept program "incompatibility" if something comes along we think is a substantially better way to get price/performance into the market.

The information came in an article headlined, "Fourth Generation... Competition," in the December issue of one of IBM's

internal publications. The article was based on an interview held recently with the two assistant general managers of the Data Processing Group, G.B. Bietzel and T.A. Papes.

Debt to Customers

Bietzel acknowledged that there was a great debt both to IBM and to customers to "maintain some consistency between where they are today and where they are going to be in the future." However, he said that it shouldn't be done at any price. He also said that the difference between the third and fourth generation will be "in terms of better service for the dollar."

The great promise for the future is in work started months and sometimes years ago, he commented. Future announcements will be determined by the best way to get better price/performance into the field and get it there before the competition does, he said.

No Evolutionary Change

Bietzel's views brought industry comment that it appeared that no evolutionary change was in sight. "It appears that customers are going to face the sudden write-off of their pro-

gramming investment once again," a leasing company executive told *Computerworld*. He pointed out that it was difficult to believe that this interview was anything but quite authoritative because of the emphasis given to the fact that work had to start years before announcements.

"No IBMer reading this will believe that Bietzel does not already have a very good idea of what is coming. So we've got to take this matter seriously. So should the user!" he said.

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Software Copyrights May Be Studied by Technology Commission

WASHINGTON, D.C. — The Senate is attempting to sidestep one of the major roadblocks holding up passage of a revised copyright law — the question of the use of copyrighted materials in computers — by incorporating a section in a new copyright measure which would establish a special commission to study the

whole computer copyright question and make recommendations which could be added to any new measure at a later date.

Sen. John L. McClellan (D-Ark.), chairman of the Senate Patents, Trademarks, and Copyrights Subcommittee, has introduced a new copyright revision bill (S543) consisting of two titles. Title I calls for the general revision of the existing copyright law (passed in 1909). Title II provides for the establishment of a national commission on new technology uses of copyrighted materials. A similar proposal was passed as a separate measure by the Senate last session but died in the House because of the lack of progress in the Senate on the general copyright revision bill. Although the computer question is not the only snag in

passage of a new copyright law — cable television is another problem area — the feeling is that if the EDP problems are eliminated, at least temporarily, it will be that much easier to get a new copyright measure on the books. The commission, which would have three years to study and compile information on the use of copyrighted works in various information storage and retrieval systems, could make recommendations for changes which could be incorporated into any new bill at a later date.

The net effect of passage of a new bill as introduced by McClellan would be to ignore the computer copyright question completely for the present. The proposed commission would consist of four members representing copyright interests, four

representing users, four presumably disinterested public members, two senators, two representatives, and the librarian of Congress, who would act as chairman.

No more public hearings will be held on the measure, according to a Senate subcommittee

spokesman, although the subcommittee will work on the bill in closed meetings for a couple of months. The Senate subcommittee's House counterpart, known as House Judiciary Subcommittee No. 3, is expected to wait for the Senate's version of the bill before taking action.

Standards Data To Be Published By Government

WASHINGTON, D.C. — A new publication series on standards activity within the federal government will be printed through the National Bureau of Standards.

The series, produced under a directive from the Bureau of the Budget, will contain information relevant to the introduction and application of standards in all data processing areas and will reference standards in other areas through an index.

The series, called the Federal Information Processing Standards Publication series (FIPS Pubs), will contain all announcements of newly approved federal standards.

Some of the technical specifications for these standards will be attached to the FIPS Pubs issue concerned, but where this is not feasible, the publication will reference the actual source of the technical definition, and provide information on where it can be obtained.

Bankers Plan EDP Directory

NEW YORK — A list of data communications consultants specializing in systems engineering design and cost effectiveness is being prepared by the American Bankers Association.

The ABA's Automation Planning and Technology (APT) program is compiling a catalog of such specialists who are interested in providing consulting services to banking and will publish it in a forthcoming data communications guide.

Organizations wishing to be included should contact Alan L. Price, research associate — communications, APT, the American Bankers Association, 90 Park Ave., New York, N.Y. 10016. Application deadline is March 31.

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FEBRUARY 1969

Program Flaws, Omissions Involved In 23% Undetected Error Rate at HEW

WASHINGTON, D.C. - Programming errors, lack of control routines and up-to-date system documentation, and mis-handling of magnetic tapes were among the computer-connected problems found by the General Accounting Office (GAO) in its recent survey of the computer payroll system at the Department of Health, Education and Welfare.

The survey [CW, Feb. 5] found an error rate of 23%. These were undetected errors, and many of the inaccuracies in employees' paychecks could have been prevented by properly programmed controls, the GAO report said.

Logic Errors in Program

Two logic errors were cited, both of which resulted in overpayments to em-

ployees. In one case when a "no payment due" card for a recently resigned employee was introduced before the "compute pay" operation, the updating of the record wiped out the fact that the employee had resigned - and the employee was issued an unearned two-week paycheck. In another case, where a new employee was hired for a part-time job which required different hours each week, it was not possible to enter any fixed "hour of duty" into his records. But the program inserted an 80-hour (two-week) tour. This in itself was not bad, although inaccurate. However, owing to the problems in getting payroll data in on time, and the importance of paying the employees regularly, the programs also automatically issued paychecks for full-

time employees even when no record of their work had been received. In combination with the inaccurate tour of duty of the part-time employees, this resulted in issuing full-time paychecks whenever the employee did not work at all, or when his work was not reported to the computer in time.

Daily Rate Used

Another computer system error was mentioned in connection with the need for programmed controls, which the GAO felt were seriously lacking. In this case a daily rate of \$43.68 was used as an hourly rate - and \$3,044.80 was overpaid to an employee. The GAO argued that a limit check of \$996 should have been in effect and should have been part

of the program. This, the report said, would have prevented the incorrect rate being used.

Master Records Lost

Similarly, the GAO felt that many of the other errors, although originating outside the computer area itself, could have been detected by the program. Another example of the lack of such controls occurred when a number of master records were lost during computer runs. HEW apparently had quite a job recovering the lost records because it did not know how many records had been lost. There were no record counts on the files. The GAO felt that these should have been there.

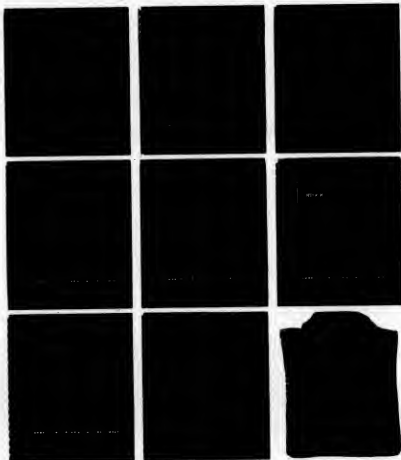
Another finding was that there was inadequate documentation. The GAO felt that there should, at the least, be two levels of flowcharts together with supplemental narrative descriptions, and that these should have been kept up to date. HEW officials were quoted as explaining that because of a manpower shortage and the emphasis placed on target dates, it had not been possible to keep the documentation up to date.

The report suggested that the target date argument might be a cover-up, commenting, "We were informed, however, that due to the significant number of errors that occurred once the system began operating, HEW personnel had not had time to prepare the needed documentation."

Operational Problems

Operational problems in the computer room also were brought out, particularly in the manual and program control of magnetic tapes. Any operator was able to obtain access to any tape, and many of the programs did not have any provision for checking the accuracy of the tape files mounted by the operator. As a result, errors occurred including the issue of 33,000 government savings bonds (value \$1.6 million), 4,000 incorrect payroll checks, and 200 duplicate payroll checks.

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Cobol Manual Delayed Again

NEW YORK - A longer wait and a lower price seem to be the latest word on the USASI Standard Cobol manual.

The U.S.A. Standards Institute has been negotiating with the Business Equipment Manufacturers Association (Bema) since last June over the finalization and printing of the document but continues to have little success.

The probable waiting period before the manual appears will be about three months, according to an informed source. This would make the date about May of this year, almost a year after the efforts began to make it available.

Computerworld learned that the final price for the document now is expected to be about \$1.50 as opposed to the range of \$4.50 to \$11 previously expected. This is about the same price that the Government Printing Office would have charged.

Previous Cobol manuals have been printed by the GPO. The reason that this document has not been submitted to the GPO for printing is that the agreement between USASI and Bema requires that USASI's copyright be protected. Were the GPO to print the document, it would enter the public domain. A major source of USASI's income derives from the sale of standards, and it insists on retaining the copyrights to such standards as they are developed by its committees.

Editorial

Computer Embezzlement

The case of Robert Mansfield, the accountant and service bureau operator who budgeted a \$1 million embezzlement on his computers, is an important one. No special programming was involved, but the computer aided him both in his financial analyses (which were essential to keep his operation unnoticed) and in the deception of noncomputer people who have an unthinking belief in computer output.

We should take a serious look at the case, and see if more precautions are needed in the future. Should, for example, an accountant be allowed to run his own computer service bureau? Indeed, should any person who has detailed knowledge of the internal workings of a firm be permitted to run the firm's work on an outside computer? If he should — then what precautions should be taken? If he should not — then who is supposed to stop him from doing so?

These are just a few of the questions which come up after the Mansfield case.

We think that there will be more — because the Mansfield case is the first really major, authenticated computer embezzlement horror story that Computerworld has heard of.

Recognized Pioneer

Often in the past we have had occasion to comment on the problems of pioneering. Misunderstanding, frustration, wasted time and effort, and sleepless nights are among the standard rewards of a pioneer. In data processing, as in most things — it is rare for a real pioneer to reap rewards, and, factually, it is comparatively rare that he even gets recognition.

Computerworld, therefore, doubly welcomes the action of the U.S. Patent Office in granting a software patent to David E. Ferguson. Although patents are often assigned to firms, they are a form of recognition which is purely personal. The inventor, and no one but the inventor, is entitled to a patent.

In the current case, Ferguson has been able to increase the usefulness of each bit in an instructional word. This makes it possible for some of our most economic computers (which often have only 12 or so bits per word) to handle the larger size, present-day memories more economically. This will be a real advantage in our constant fight for economic computerization.

That is real achievement, and we are glad that at least one of our pioneers has received deserved recognition.

COMPUTERWORLD '69



"You know—I think I could make it if I didn't have this advertising job"

Research Report

New Multifile, General-Purpose Package Solves Many Data Retrieval Problems

By Peter L. Briggs
CW Staff Writer

A reasonable solution to many of the problems presented by general purpose information retrieval systems seems to be offered by a new multifile, general-purpose package from Infodata Systems, Inc.

Much attention has been focused recently on the use of general-purpose file-inquiry systems for all levels of commercial installations. Service bureaus, time-sharing services, in-house systems, and special service operations such as financial services have been quite concerned over the inability to retrieve data conveniently once it is stored in the system.

Data Retrieval Problems

It is usually possible to find the data again, but it requires special programs and computer runs to actually make any use of it. This has spurred interest in on-line data retrieval and raised several questions about data security.

A recently released system, called Inquiry, developed by Infodata Systems, Inc., has many features to recommend it for rapid, safe data retrieval.

Data Protection Important

One of the many areas placed under close scrutiny in the design of the system is that of file protection and security. The company has developed a password system which can permit almost any required degree of flexibility and security through a series of hierarchical priorities.

It is possible to allow selected users to read only certain portions of the information stored on a specific item, other users to update certain portions and still others to perform selective tasks of either retrieval or updating, all without overlap of data access.

Keyword Accessing

The basic technique is one developed from keyword-in-context types of indexes. When an item is added to one of the files, certain information is tagged as the accession of files from any possible combination of keywords or keyword-values in any desired sequence.

In addition, this technique permits the user to combine the keywords in any logical sequence, to selectively include or exclude any group of data entries, and to optimize the search path through the file.

Initial users report that the system is easy to use, and quite convenient. This has not been the case with many information retrieval systems. The language used is definitely English, and not "computerese." The sequence of commands is logical and requires little or no explanation [see box].

Technical Specifications

The system is written in PL/I to take advantage of the extensive data handling facilities provided in the language and runs under OS in a 90K partition. Certain parts of the I/O routines are written in Assembly Language, to facilitate the tailored search technique.

All data management is done through the normal OS Data Management Supervisor, allowing the file capabilities of the system to be, effectively, device independent.

Advantages to Users

Certain points about the system are certainly an improvement over most systems developed in-house. For one thing, the cost is quite reasonable, \$22,000 for sale and \$1250 a month for leasing. It is very doubtful, based on a conservative estimate of manhours involved, that an installation could develop such a system for its own tailored needs for less than about twice that figure. The system also has the advantage of outside support, thus requiring little time from the programmers who would have to maintain a system written in-house. The system appears to support an unlimited number of users, with as many files on-line as are required by the installation.

Output Control Excellent

The system provides the interesting feature of controlled output reports, whether on tape, disk, or printer, through the use of a very simple TABULAR statement. The statement permits headings to be inserted at appropriate intervals, columns to be defined, and multiline reports to be generated.

If no control is desired, a simple listing of the data, with the field names, is produced for each item retrieved. The system also permits storage of up to 20 predefined formats for output, permitting a user to obtain formatted output without the need to know how formats are created.

Managers and executives of companies using the system should find the approach to data retrieval

(Continued on Page 5)



COMPUTERWORLD
THE NEWSLETTER FOR THE COMPUTER COMMUNITY

Weekly Newspaper — Second Class Postage Paid at Boston, Mass. Published every Wednesday by COMPUTERWORLD, Inc. 60 Austin St., Newton, Mass. 02460. Telephone: (617) 332-5606 & T.V. 710-332-6635. Copyright 1969 by COMPUTERWORLD, Inc. Alan Taylor, Editor. Robert M. Patterson, News Editor. Evelyn Cowell, Special Supplement Editor. Neal Wilder, National Sales Manager. Margaret Phelan, Circulation Manager. Henry Fling, Art Services Supervisor. Kate Rachstein, Typesetting Services Supervisor. Patrick J. McGovern, Publisher. W. Walter Boyd, Associate Publisher. Subscription rates are \$9 for one year, \$16 for two years. Add \$1 per year for Canada; \$3.50 per year for Foreign. Please send all editorial and subscription material to: COMPUTERWORLD, 60 Austin St., Newton, Mass. 02460. (617) 332-5606.

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System Simplifies Retrieval of Data

(Continued from Page 4)
convenient because they will be able to retrieve just those portions of the data they require without any particular effort.

System Drawbacks

One problem which must arise with any on-line system is response time. The system cannot respond any faster than the actual data can be retrieved. In this case the retrieval speed is probably between 1 and 5 seconds, assuming the system is not overloaded.

File Organization to Blame

The indexes for the system, where the keys to find the data are stored, are organized as indexed, sequential files. Under OS/360, random retrieval of such files is quite slow, requiring as many as three or four disk accesses to locate the appropriate index entry. This tends to saturate the I/O

channels, reducing the speed with which I/O requests can be satisfied. The limitations are really in the hardware, rather than in the software, because the computer does not really have the capability to satisfy this type of large-scale I/O under current configurations.

Area for Application

Real estate, finance, account management in any type of business, management information, inventory systems, bill of material processing, shipping, sales orders, and name and address lookup are, I think, all suitable for this type of retrieval system.

It seems probable that the system could be adapted for graphic CRT output, as well as for data terminals and Teletypes. This would expand the scope of applications into any field where information has to be looked up, updated, or deleted.

Typical Search and Output Sequence for Inquire System

Sample Query:

- (1) START 'PETER BRIGGS', COMPUTERWORLD
- (2) FILE = SUBSCRIPTION
- (3) FIND 'DP MANAGER' OR 'D.P. MANAGER' OR 'DATA PROCESSING MANAGER'
TABULAR NAME 5 COMPANY 30 CITY-STATE 60.

Sample Output

NAME	COMPANY	CITY-STATE
TOM T. SMITH	EFGH INSURANCE	BOSTON, MASS.
JOHN L. JONES	BANKER'S BANK	NEW YORK, N.Y.
R.J. WILSON	MONEY FINANCE COMPANY	OSHKOSH, WISC.

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Tester Checks 2316-Compatible Disks

PHOENIX — A disk tester for IBM 2316-compatible disks has been put into production by Peripheral Inc., developer of the original 2311 disk tester, the first made commercially available.

The new device, called the Model 326, comes with three operating modes: automatic, for use as a verifier for production disks; semiautomatic, for process control application; and manual, for comprehensive engineering studies, according to the company.

When run in the fully automatic mode, the unit produces a six-position listing of the type of disk fault and the location. The machine automatically positions the heads, and loads and unloads the arm mechanism.

The complete test cycle takes four minutes, for testing on both surfaces of the recording plate. The unit tests for signal ampli-

New Products

tude (strength), missing pulses, extra pulses, noise interference and peak modulation (distortion), using the standards pro-



vided in the IBM document, IBM 2316 Specifications (A26-5554-1).

While running in semiautomatic mode, the machine stops at every error detected, and displays the error on a nine-tube display, while providing delayed synchronization for an oscilloscope so that the error can be displayed on the scope.

The manual mode provides manual write at two frequencies, manual erase, and manual carriage control, in addition to the semiautomatic functions. The unit sells for \$26,000 f.o.b. Phoenix.

Display Terminal



A new keyboard display terminal, the VT03, operates similarly to a conventional teleprinter, and incorporates carriage return and line feed characters for position control. The console is full duplex with a local memory for display refreshing, alphanumeric keyboard, editing capability from keyboard or computer, and audible end of line and incoming message tones.

Priced at \$7900 with interface option at \$400, the first deliveries are scheduled for the summer of 1969. Digital Equipment Corp., Maynard, Mass. 01754.

Portable Data Coupler



A new portable data coupler was designed for time sharing and will connect to any convenient telephone handset. Data terminals compatible with the coupler are Teletypes, and terminals with an EIA communications interface (keyboard printer terminals, etc.).

The model 327 is available for Originate only mode of operation. Standard features are half and full duplex operation and a "carrier-on" indicating light. An optional circuit monitor speaker is available. Data Communications Systems, Inc.

Data Acquisition System



A new data acquisition system will multiplex and digitize 64 channels of low-level analog data onto magnetic tape. A successive approximation A to D converter is optional.

Control and display panel of the Model 710 includes a sample rate switch, 6-digit file number entry switch, and multiplexer controls. Standard output medium is 7-track, computer-compatible magnetic tape. List price is \$12,800 f.o.b., Waltham, Mass. IRA Systems, Inc., 332 Second Ave., Waltham, Mass. 02154.

Reader/Spooler



A new high-speed tape reader/spooler, 4002/4003, operates at 1000 characters per second and will store 1000 feet of 0.005 inch paper tape, rewinding at the rate of 200 inches per second.

It will stop on character at 600 characters per second, with copy/start speeds from 1 to 500 characters per second and will handle 5- to 8-level tapes. Ferranti-Packard Electric Ltd., Electronics Div., Industry St., Toronto 15, Ontario, Canada.

Desk Calculators



Four new calculators, Series 200 are designed for use in banking, business, insurance, statistics, and education. In addition to basic add, subtract, etc., the models include square and square root for calculation of mean values, four extra data storage registers for frequently used constants, and four extra registers. Wang Laboratories, Inc., Tewksbury, Mass. 01876.

Tape Reels



New precision tape reels are available for use with either precision magnetic or punched

paper tape applications. The reel hub is die cast of aluminum alloy and is available for conventional and custom reels in plain or anodized finishes. Hyatt Precision Accessories Corp., 4656 Lincoln Ave., Cypress, Calif. 90630.

Time-Sharing System



A new Series 16 time-sharing system has been designed for business, scientific, and engineering applications software, and four computer languages. Made up of three processors, two tape units, and four disk units, the system leases for \$12,000 per month. Honeywell Computer Control Div., Old Connecticut Path, Framingham, Mass. 01701.

3-Wire Core Memory



A new core memory, Model 25DM-500, priced from \$14,000, uses 2-1/2D three-wire design and 8-mil cores for high speed. Memory is modular and is expandable to a five-million bit capacity. Ampex Corp., 401 Broadway, Redwood City, Calif. 94063.

Performance Monitor



A new computer performance monitor has been designed for use with IBM System/360, 1130, and 1800 computers as a means of identifying system imbalances, monitoring system utilization, locating performance bottlenecks, and providing the information necessary to improve and maintain a data processing system's efficiency.

The unit is equipped with plug-board Boolean logic capability and an integrated magnetic-tape data recording system.

Prices quoted on request. Delivery approximately 90 days. From receipt of order. Heurich Systems, P.O. Box 3262, Santa Monica, Calif. 90403.

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Division Formed To Manage CSC Service Bureaus

LOS ANGELES—Computer Sciences Corp. has formed an Information Network Division to establish, operate, and market the services of its transcontinental network of regional time-sharing computer centers.

Marvin J. Franklin has been appointed vice president and general manager of the new CSC division.

Computer Sciences, which announced plans in mid-1968 to create the network, subsequently ordered 20 large-scale Univac 1108 computers valued at \$50 million and began development of the complex programming required for the time-sharing system.

The Information Network Division will establish regional computer centers in principal cities throughout the United States and Canada beginning in mid-1969. The first Univac 1108 ordered has been installed in Los Angeles and is being used as a development center for the system.

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System Tells You Which Way to Go

WASHINGTON, D.C. — Ever have that sinking feeling in your stomach when, while driving on a high-speed highway, you miss your exit because you didn't see the directional sign in time?

An Experimental Route Guidance System that may eliminate those missed turns and make driving safer is being tested by the Bureau of Public Roads, U.S. Department of Transportation.

A key part of the system is the Head-Up Display which projects one of a basic set of 16 directional symbols onto the car windshield.

The Head-Up Display which is mounted integrally with the dashboard and comprised of optical elements, a symbol selection subsystem, and a light source, causes the directional symbol to appear to be focused at infinity and superimposes it on the road scene. The driver can observe both the road and the symbol simultaneously without refocusing his eyes on the windshield.

As envisaged by the Bureau of Public Roads, a nationwide road-side computer network, an in-vehicle computer-decoder, and the windshield display system

would constitute the Experimental Route Guidance System.

A driver using the proposed system and traveling, for instance, from New York to Chicago, would use a directory to select a code symbol for his destination. The symbol would be punched into the in-vehicle computer-decoder, "locking in" the driver for the duration of his trip. However, should he change his destination, he merely re-enters the code for his new destination.

Triggered Automatically. As the vehicle approaches an equipped intersection, a coded message from the computer-decoder, which is being developed separately by the Bureau of Public Roads, reaches a loop antenna buried in the roadway and connected to the road-side computer. That computer receives and decodes the vehicle destination code and then transmits directional instructions back to the vehicle to trigger the windshield display. At the same time, an audible beep warns the driver that instructions are about to be given.

The 16 directional symbols used include 11 arrows and five



The experimental automatic route guidance system flashes an arrow on the windshield as the car approaches an intersection at which it should make a right turn.

simple two or three-word instructions. The driver, by arrow or phrase, may be told to continue straight ahead, make a right turn, take the second left, etc.

The display, developed by the Kollsman Instrument Corp., illuminates the computer's signal in

a 1.5" amber-colored image in the driver's line of sight on the windshield. Tests have shown that the driver could move his head 9° from side to side or 5° vertically and still see the directional symbol with both eyes.

A prototype Head-Up Display has been installed in a Bureau of

Public Roads vehicle for testing, and the Bureau also is experimenting two intersections in Washington, D.C. for further tests of the Road Guidance System. A variation of Kollsman's unit has been used in airplanes for years to provide pilots with visual cues.

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Computer-Assisted Research Goal: An End to Bumpy, Potholed Roads

COLLEGE, Alaska — A computer is helping to smooth those bumpy, washboard roads left in winter's wake across the colder parts of the nation.

Engineers at the University of Alaska are trying to learn more about the heaving effects that winter's freezing and thawing have on soils — a major cause of buckled roads.

The studies are aimed at reducing seasonal damage to highways and other structures in cold climates. They might also lead to the agricultural development of areas where subarctic soils remain permanently frozen throughout the year.

"Damage caused by the transfer of heat in soils is a particular problem to highways, airport

runways, and underground utilities in areas such as Alaska," said Dr. Harold R. Peyton, associate professor of engineering with the university's Arctic Environmental Laboratory.

"These heat transfer problems are more difficult than predicting a rocket's re-entry course," he said. "Based on computer-assisted analysis to date, however, it appears that a judicious use of styrofoam added to permafrost soils prior to paving would help stabilize road beds and prevent seasonal buckling and other damage."

In their studies, engineers are using a special test apparatus to monitor soil samples. Every 12 seconds data about the effects of temperature, moisture content, and other factors is automatically punched into cards. This information is being used by the university's IBM 360/40 to create a mathematical model of the earth's crust to a depth of 75 feet.

Using the computer, engineers can simulate differing soil conditions and determine how they are affected by freezing and thawing. These studies lead to a better understanding of how to modify and control the soils to avoid damage to structures.

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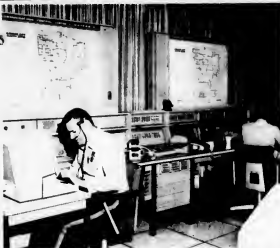
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The communications control center at Kansas City police headquarters makes the computer almost instantly available to officers in the field.

Police 'Alert' System Lives Up to Expectations: Kelley

KANSAS CITY, Mo. — After six months of operation, Kansas City's police computer system has lived up to its promise as an effective crime-fighting tool, according to Police Chief Clarence Kelley.

Between July 1 and Dec. 31, the Alert (automated law enforcement response team) system answered 110,000 questions from officers in the field. The average response time was 10 seconds, and more than 2000 of the answers led to arrests or the recovery of stolen cars, according to Lt. Col. James R. Newman.

New Capabilities

Since *Computerworld's* story

on Alert [CW, Aug. 21], a new cross reference capability has been added. When an officer is sent to answer a complaint, the computer can forewarn him of possible problems he may face by checking the address against a list of 4000 persons known to be armed or dangerous, to be likely to resist arrest.

Privacy Protection

The privacy of law-abiding citizens is fully protected because only people with police records are identified by the system, Col. Newman said.

The files contain records on 16,000 warrants and wanted per-

sons and 24,000 records on past criminal histories.

Before the new capability was added, officers in the field primarily used the system to check out vehicles before stopping them for traffic offenses. The computer warns the officer if the car is stolen or the owner wanted.

Future plans for Alert include interfacing by microwave link with the FBI computer in Washington, D.C., and with the metropolitan area police departments, Col. Newman said.

Time-Sharing Is Fastest Growth Area: Diebold

CHANDLER, Ariz. — Time-sharing is the fastest growing area in the computer industry, according to a research report by the Diebold Group and presented at the 19th regular meeting of the Diebold Research Program here.

"Improved performance and economic advantages over traditional methods of data processing," says Ernest von Simon, assistant director of the program, "help account for time-sharing's growing acceptance among computer users. Some users state that program development can be performed in a time-sharing system five to ten times faster than in traditional batch processing."

Alternatives Available

For users who decide to take advantage of time-sharing's power, there are three major ways in which they can implement it.

The first involves subscription to a commercial service, the second requires developing in-house software for a commercially available hardware system, and the third involves developing hardware and software tailored to time-sharing, according to the report.

Volume of processing, financial considerations, types of hardware available, and the local availability of commercial time-sharing services are the prime factors in forming the decision, the report pointed out.

Other features of the group's report included a demonstration of the use of time-sharing in predicting the outcome of game strategy for football, showing the uses of gaming theory for corporate executives, and a description of what Diebold considers to be the most sophisticated library system in the world that developed by Iowa State University. A commercial version of the Iowa State system is currently available.

The Diebold Research Program, now in its fifth year, is an industry sponsored continuing study of the impact of change in management and information systems on today's decisions and planning. The program is conducted by the professional staff of The Diebold Group, Inc.

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Computer Procurement Needs Defined Procedures, Plans

By William W. Cotterman
Cw Contributing Editor

Several advantages accrue to the author of the first book in a given area, such as *Computer Selection*. First, since he is pioneering, he garners a certain respect for that alone. Second, since there is no competition, his work cannot "suffer by comparison," and finally, he satisfies the basic requirement necessary to use the phrase "this book fills a long-felt need..." in his preface.

Mr. Edward O. Joslin, however, reprints himself admirably and his preface simply notes that computer selection has received something less than its fair share of attention in the literature. The reviewer, however, is not averse to a cliché or two and hereby notes that *Computer Selection* fills a long-felt need for a thorough discussion of the problems peculiar to computer procurement.

Computer Selection is directed to the individuals who are directly involved in the computer selection process although the author feels, and we agree, that management personnel will also be able to read and benefit from the book. The entire presentation assumes that a systems study has been performed, that the true system requirements are known, and that system specifications are defined.

Development of Plan

Given the system specifications, the task is to develop a selection plan; for, as the author notes, anyone can write a report justifying the selection which he has already made, but this certainly does not make the selection process objective. Complete objectivity may never be achieved but the pre-establishment of a selection plan is a major step in this direction.

- A review of the system specifications
- Techniques to be used in evaluating computer system proposals
- Techniques for the validation of the capabilities and timing of proposed computer systems.

Specifications Defined

Specifications can be thought of as imposing limitations on prospective computer systems, and these limitations can be mandatory or simply desirable based on how essential they are to the satisfaction of system requirements.

The author discusses limitations with respect to ten aspects of computer systems and concludes that virtually all limitations — even cost and desirable — should be treated as desirable rather than mandatory in order that vendors may be free to bid their best system against the over-all specification.

Cost-Value Technique

The Cost-Value Technique which is essentially a process of arriving at a base specification-satisfaction cost by the discounting of extra features is recom-

Reviews at a Glance

TITLE	Author	Evaluation of Information Systems
<i>Computer Selection</i>	E.O. Joslin	M.M. Henderson
AUTHOR	172	209
NO. OF PAGES	\$7.95	\$1.00
PRICE		
PUBLISHER	Admission Weekly	Government Printing Office
FORMAT USED	Text	Abstracts
PROBLEMS USED	None	None
INDEXED	Yes	Yes (to authors and organizations)
BIBLIOGRAPHY EMPHASIS	Yes	Selected guide
METHODOLOGY RECOMMENDED	The development of a selection plan which includes cost-value evaluation and validation of capabilities.	The evaluation of information retrieval and document reference systems. Many are included in the abstracts.
READER'S BACKGROUND PRESUMED	Reads a general knowledge of computer and computer applications.	Requires a substantial knowledge of information retrieval and document reference systems. Specialist.
RECOMMENDED FOR	Top management, supervisory management, systems analyst.	

ended as the best technique for the evaluation of computer systems and is discussed in detail. The author provides sample lists of both costs and equipment characteristics and discusses possible improvements which might be made in the Cost-Value Technique itself.

Bid Validation

The discussion of the validation of vendor bids is dominated by the validation of system timing. The author strongly advocates the use of typical application programs carefully organized according to typical workloads into a benchmark problem for the validation of timing. The development and use of benchmarks is analyzed in detail. As an alternative to both hand timing and benchmark programs computer simulation in the form of SCERT (Systems and Computers Evaluation and Review Technique) is described at length with illustrations of both input and output data.

Procurement Plans

In addition to discussion of the selection plan, *Computer Selection* includes a relatively brief section on procurement plans, a section on the relationship between user and vendor, and an extensive selection example which illustrates and summarizes the discussion of the selection plan.

Joslin is obviously very experienced and knowledgeable in the processes of computer selection, and he has done a creditable job of filling this gap in computer literature.

Software Treatment

The major weakness of the book is its treatment of computer software. Software is an increasingly important element in computer systems and deserves explicit attention apart from its role in benchmark timing.

The consideration of procurement plans is rather sketchy and simulation techniques other than SCERT are ignored. In general, the weaknesses of *Computer Selection* result from omission

rather than commission and the book is well worth reading at its stands. We will simply look forward to an expanded second edition.

book reviews

Retrieval and Reference Stressed in Bibliography

By William W. Cotterman
Cw Contributing Editor

The Evaluation of Information Systems: A Selected Bibliography With Informative Abstracts is the partial result of a survey of the literature conducted by the Technical Information Exchange, Center for Computer Sciences and Technology, National Bureau of Standards. The bibliography includes literature through June, 1965, and is concerned almost exclusively with references dealing with the evaluation of information retrieval or document reference systems.

Abstracts are grouped into the four categories:

- Comparative evaluation
- Descriptive evaluation
- Discussion of evaluation factors
- Proposals

The subject area of this bibliography does not include data processing systems or the hardware of such systems. A majority of the abstracts are concerned with the testing and evaluation of indexing techniques and systems although a few of the references do deal with general information systems.

With the exception of seven abstracts in Section 2 which are concerned with the analysis of text and selection of index terms by machine processes, computers, if mentioned at all, are strictly subsidiary to the other subject areas. The abstracts in this bibliography are compact, and no effort is made to define terms or clarify concepts. As a consequence, while this book would be of value to individuals directly involved with information retrieval or document reference systems, it would be of little value to other readers.

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Response System Provides Fast Feedback to Teacher

SCHENECTADY, N.Y. — A new computer-supported educational system — designed to enable an instructor to monitor the performance of individual students working in large classrooms as well as in independent study booths — will be marketed this year by General Electric.

The system — GE's Student Response System (SRS) 1000 — represents four years of research including a test of student response equipment at Syracuse University and Southern Illinois University.

"To offset soaring enrollments and operating budgets, educational institutions are building an increased number of multimedia classrooms with a capacity of 100 to 500 students as well as investigating the use of independent student study, augmented by audio-visual displays in individual study carrels," E. Lloyd Rivest, manager of Information Systems Programs, said.

More Feedback

"Both approaches — although

excellent in presenting data to the student — tend to be 'one-way' systems that fail to provide feedback on a timely basis either to the instructor or to the student. The SRS 1000 was designed to provide this feedback by rapidly processing data generated by individual students engaged in large classroom or independent study activities. As a result, the instructor can monitor the performance of students and can provide them with individualized attention," Rivest said.

In the large classroom, the SRS 1000 provides each student with an electronic response panel. This panel enables the student to respond to questions posed by the instructor during brief pauses in a lecture presentation. The results are displayed immediately to the instructor.

As a result, GE said, the instructor has a rapid and effective tool for measuring the effectiveness of his presentation — as he makes it. He knows whether to continue the pace and content

of his lecture, to backtrack and review previously-presented material, or to accelerate the pace, the company said.

Detailed Reports

Equally important, the time-sharing computer connected to the system can provide the instructor with detailed information about individual student performance. This information can be used in many ways — ranging from the identification of students with problems to the determination of individual homework assignments, to the modification of the instructor's own presentation.

The system also can be operated in an anonymous mode — without any record as to which student is responding — in polling the class and measuring attitudes. In addition, the system can be operated automatically when an instructor is not present.

The student response panel in the SRS 1000 system consists of six pushbuttons — five of which are used in answering multiple-choice questions. The sixth button permits a student to cancel or "erase" a choice and change his response. The system also provides a signal which indicates when a student has made a selection and which can be coupled to timers or counters to measure response time.

In a large classroom, the instructor's console contains five meters that indicate the percentage of students making each of the five multiple-choice selections. A sixth meter shows the total percentage of students responding to the five choices. At his discretion, the number of the correct response can be revealed to the students by a central display unit in the classroom.

Flexible Installation

The SRS 1000 was designed to be used in large classrooms or in individual study carrels, or in combinations of both. In either situation, the system permits a student to enter his identification number, course number, and question number on an individual card. Based on this modular design, additional input stations may be added at a later date with little effort. The system is capable of working with a Modem 33 or 35 Teletype or Teletype DRPE High Speed Punch. It can work off-line or on-line with any computer that responds to the five choices. At his discretion, the number of the correct response can be revealed to the students by a central display unit in the classroom.

SRS 1000 systems concurrently are under installation at the University of California (San Diego) Medical School and State University of New York at Albany, according to Alfred S. LeBlang, manager of the SRS 1000 project in GE's New Business Development Operations.

GE plans to market the SRS 1000 to additional educational institutions on a limited basis, LeBlang said.

Time-Sharing System Designed to Serve 11 Colleges

DAYTON, Ohio — The University of Dayton plans to install an RCA Spectra 70/46 time sharing system to serve it and 10 other colleges which comprise the Dayton-Miami Valley Consortium. The group was organized last year to further higher education in the greater Dayton area. The \$1.5-million computer system will be used for research and academic uses as well as for administrative tasks. It will be the first installation of the RCA time sharing system at a university, RCA said.

The machine will be used by students majoring in mathematics, science, engineering, and business, all of whom are required or encouraged to take data processing courses. Students and faculty in the arts and humanities will be encouraged to use the computer in university education and research programs. The university offers baccalaureate degrees in computer science and master's degrees in information science.

Joseph Ross, acting director of the university's Computer Re-

sources and Development Organization, said that records on hundreds of thousands of volumes in the university's libraries will be stored in the computer system. Eventually the system will be expanded to handle the 1,000,000-volume capacity of the school's new library now under construction. Book circulation will be recorded via special student punched cards.

Administrative accounting chores, such as general ledger, payroll, and equipment inventories, will be handled by the system, as well as registration, class lists, and final grade reports.

Other Members

Members of the Dayton-Miami Valley Consortium, located within a 35-mile radius of Dayton, include: Antioch College, Cedarville College, Central State University, Sinclair College, Urbana College, Wilberforce University, Wilmington College, Wittenberg University, Wright State University, and the Air Force



The Very Rev. Raymond A. Rosch, president of the University of Dayton, watches a demonstration of the remote terminals to be installed at the university.

Institute of Technology. The consortium totals approximately 80,000 students, ranging from a 10,000 high at the University of Dayton to 470 at Urbana College.

Rosch said ultimate plans call for using several remote communications terminals in the dormitories on the university campus. Later in the 1969 academic year, additional terminals will be made available to consortium members.

Communications units will include the RCA Video Data Terminal.

Planned Uses

Students in the Computer Sciences Department will use the Spectra 70/46 to develop software systems and for research in soil mechanics, structural analysis, engineering design of high-

ways, electronic circuit analysis, and other problems will be handled by the system for engineering students. The School of Business Administration, including its graduate school, plans to use the computer to study accounting cases and for management games and economic models.

In addition to the instructional uses, the Research Institute conducted experimental projects valued at more than \$5 million annually. A project now under negotiation with the Ohio State Bureau of Public Roads calls for a three-year study of computerized traffic control. Utilizing the computer will help weigh the effectiveness of various traffic control modes and indicate optimum placement of detectors. A major aim is to develop a handbook so that any Ohio town or city can work out its own automated traffic control system.

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SKOKIE, Ill. — Physicians should find a new accounting and bookkeeping system a tremendous time saver, according to the developer, Computer Management Consultants.

Termed Compudoc, the new system "could be used creatively to help a busy physician completely organize the billing and accounting functions of his practice," according to Gerald A. Finkle, company president.

Use of the system is based on the purchase or lease by the doctor of a Touch-Tone type data-transmission unit with card-insertion and receipt tape-printout capabilities, a set of plastic cards imprinted with account numbers representing the practice, the patient, and their respective addresses, and another set of plastic cards with account numbers which represent professional services performed.

The transmission device is connected by dial-up telephone to the central data acquisition facility which transmits the data at desired intervals to a central computer.

The computer stores the information by imprinting it on a two-part form. Weekly or monthly, whichever is desired, the secretary calls up the system, and triggers the transfer of information from the collection station into the computer. The computer updates the physician's files, reports an inventory of supplies and pharmaceuticals, prepares a monthly account statement for patients, and mails the statements on a personally printed billing form directly to the patient.

The costs of Compudoc are minimal, according to Finkle. He stated that the company has estimated the cost of an average transaction to be about 21 cents, including all related services.

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This weather map, based on satellite data collected by the Environmental Science Services Administration of the U.S. Commerce Department, was drawn by a new software system operating a laser graphics plotter.

Software Package Drives and Scans in One Operation

ST. LOUIS, Mo. — "A major advancement in software development for computer-driven plotters" is the description applied to a new software package by Roy T. Bogan, Houston regional manager for the developer, McDonnell Douglas Corp.

The new plotting system drives an LGP-2000 Laser Graphics Plotter, manufactured by Dresser Systems, Inc. of Houston, and available since 1966. The plotter uses a laser optics system to produce contour maps, engineering drawings, geographical cross sections, and various other forms of graphic representations.

The major advance in this software, according to Bogan, is that the computer is able to drive the plotter for one scan while performing the large number of calculations necessary to scan the next line.

The plotter operates at about 3000 scans of a 40" photographic negative per minute, requiring thousands of computations per line. With a density of 200 lines/inch, the resolution is excellent, according to the company.

This type of dot-density coloring permits extreme flexibility when drawing any type of map or shaded drawing, according to

the company. It is possible to define a point of almost any size down to about 1/200th of an inch and retain extreme resolution, all within the software decoding system.

The new system was developed to produce weather maps and other types of complicated outputs at high speed. It is based on the plotter's ability to produce

dots of different densities, permitting the plotter to produce several shades of grey on the negative.

The software runs on the IBM 360, but contracts are under development to produce hardware support with the IBM 1800 Data Acquisition System, and for other maker's equipment, according to Bogan.

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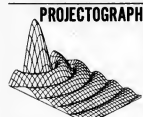
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The conversion is performed on the 1401 object code, rather than the source language, and is operated as a service bureau system.

The service, called Upgrade, provides turnaround time of about three weeks from anywhere in the U.S., according to the company. The cost is 50 cents per source statement, with a minimum of 3000, or 80 cents per object statement, with a minimum of 1000.

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\$6 Million in Debentures Sold by Access, Digitek

NEW YORK—Two corporations sought private placement for \$6 million of convertible subordinated debentures in January.

\$5 Million to Access

Access Corp., a Cincinnati-based manufacturer of records automation systems and information control systems, has issued a \$5 million, 6% convertible subordinated debenture to the Prudential Insurance Co. of Newark, N.J.

The note is convertible into 200,000 shares of Access stock at the rate of one share for each \$25 of the \$5 million.

The note is due in full on Nov. 1, 1983, and no principal prepayments are required until Nov. 1, 1974. This represents the first use of debentures since Access was incorporated in 1963. The

major financing was required by the leasing of the company's System 60 automated filing equipment to users and the nationwide extension of marketing operations in 1969.

\$1 Million to Digitek

The first stage of a program to expand its computer time-sharing services nationally was completed by Digitek Corp. of Los Angeles with the private placement of \$1 million of 7% convertible subordinated debentures, due in December, 1978.

Digitek's on-line proprietary time-sharing services, now used primarily by wholesale distributors in the Southern California area, will be made available nationally with the establishment of eight centers in key metropolitan locations, starting with Chicago.

IBM Dividend Rises 15 Cents, Watson Sees Bright Future

ARMONK, N.Y.—Increased dividends, annual meetings, and annual reports were the topics of interest at a recent IBM Board of Directors meeting.

The directors declared a regular quarterly cash dividend of \$3.80 per share on the common stock, payable March 10, 1969, to holders of record Feb. 13, 1969. The former quarterly rate was \$3.65 per share.

The annual meeting for stockholders will be held in Santa Monica, Calif., April 28. Previous stockholder meetings were held in Yorktown Heights and Endicott, N.Y.; Chicago; San Jose, Calif.; Houston, and Boston, as well as New York City.

The company also announced its directors had approved the company's 1968 annual report for mailing to stockholders.

IBM Chairman Thomas J. Watson, Jr., in a letter to stockholders which will appear in the annual report, mentioned again that the imbalance between leasing income and outright purchases could possibly cause a marked decline in income for a future period.

However he added, "This aspect of accounting period comparisons does not alter the fund-

mental prospects for IBM's business, which we believe will continue to be very good. This belief is supported by a continued high level of orders and production of IBM products throughout the world."

Watson defended IBM in the Justice Department, Control Data, and Data Processing Financial & General antitrust suits by saying, "...the data processing industry is one of the healthiest

and most competitive in the nation, an industry which is growing at a faster rate than the IBM Corp."

"The computer business, which virtually did not exist 20 years ago, has grown into a multi-billion dollar industry that has attracted more than 60 systems manufacturers and some 4000 companies dealing in related equipment, support, and services."

Information International Stock Offer Is Sold Out

NEW YORK—Information International's entry into the large-scale optical character recognition system market was speeded up recently by investors who quickly oversubscribed a common stock offer.

The offering was made in units, each containing two common shares plus warrants to buy an additional share at \$33 through Jan. 29, 1972. There were 125,000 units priced at \$61 each for a total market value of \$7,625,000.

Of the 250,000 new shares,

240,000 were offered by the Cambridge, Mass. firm to its names optical character recognition systems and related activities, and the remaining 10,000 were offered by a selling stockholder.

Information International makes products that read, process, and interpret images such as blood cells and complex waveforms, in addition to high-precision film readers, recorders, and high-resolution scanners.

It has about 2.5 million shares outstanding.

New Registrations

METRODATA COMPUTING, Inc., 660 Gracie Lane, Louisville, Ky., a computer service company, filed to register 125,000 shares of common stock. Proceeds, at \$12.50 per share maximum, intended for payment of debt, program development, furniture and fixtures, and marketing expense. The underwriter is Stone, B. & Boyce, 1 Charles Center, Baltimore, Md.

I.D.A. DATA CORP., 383 Lafayette St., New York, a computer leasing firm, filed to register 250,000 shares of common stock. Proceeds, at \$8 per share, intended for purchase of new and used equipment and for debt repayment. The underwriter is Glantz & Co., Inc., 44 Wall St., New York 10005.

VIRGINIA DATA CENTER, Inc., 813 High St., Portsmouth, Va., a computer service company, filed to register 250,000 shares of common stock. Proceeds, at \$2 per share, intended for new building and payment of debt. The underwriter is A.J. Carlo Co., Inc., 42 Broadway, New York.

REPUBLIC SYSTEMS & PROGRAMMING, Inc., 100 Plaza Center, Secaucus, N.J., a computer consulting firm, filed to register 400,000 shares of common stock. Proceeds, at \$10 per share maximum, intended for payment of debt, inventory, research, and working capital. The underwriter is Rouse & Bates, Inc., 32 Broadway, New York.

DATA PACIFIC CORP., 716 N.E. 55th, Portland, Ore., a computer component manufacturer, filed to register 155,877 shares of common stock. Proceeds, at \$10 per share maximum, intended for payment of debt, inventory, research, and working capital. The underwriter is June St. John Co., 229 S.W. Broadway, Portland, Ore. 97205.

APPLIED COMPUTER CORP., 41 E. 28th St., New York, a computer service company, filed to register 150,000 shares of common stock. Proceeds, at \$7 per share maximum, intended for equipment, marketing expense, research, and working capital. The underwriter is Brand, Burnett & Steier, Inc., 42 W. 33rd St., New York, 10001.

ADVANCED SYSTEMS, Inc., 1100 W. Northwest Hwy., Mt. Prospect,

Ill., a computer consulting and training company, filed to register 150,000 shares of common stock. Proceeds, at \$5 per share, intended for equipment, debt, and expansion. The underwriter is Freeman, Fronick & Frost, Inc., 140 Broadway, New York, 10005.

WILSON LEASING CO., 3550 W. Peterson Ave., Chicago, Ill., a leasing firm, filed to register 125,000 shares of common stock. Proceeds, at \$11 per share maximum, intended for payment of debt, acquisition and the purchase of equipment. The underwriter is H. C. Co., Inc., 135 S. LaSalle St., Chicago, Ill.

DATA SCIENCES, Inc., 1225 Connecticut Ave., N.W., Washington, D.C., a computer services company, filed to register 280,000 shares of common stock and 140,000 shares of preferred stock (\$50 cents par). Proceeds, at \$14 per share (preferred common) unit maximum, intended for payment of debt, acquisition and development, and equipment. The underwriter is Greig & Sons, 40 Wall St., New York 10005.

VDYING INSTRUMENTS & PRODUCTS CORP., P.O. Box 1366, Evanston, Ill., data recorder manufacturers, filed to register 100,000 common shares. Proceeds, at \$12 per share maximum, intended for product development, inventory, and working capital. The underwriter is Union Western Securities Corp., 6500 Wilshire Blvd., Los Angeles.

DMS COMPUTER INDUSTRIES, Inc., 641 Rutledge Ave., Eastwood, Cincy, N.J., a computer services company, filed to register 125,000 shares of common stock. Proceeds, at \$6 per share, intended for equipment and for sales promotion. The underwriter is Mulholland, Kaufman & Brady, Inc., 40 Exchange Pl., New York.



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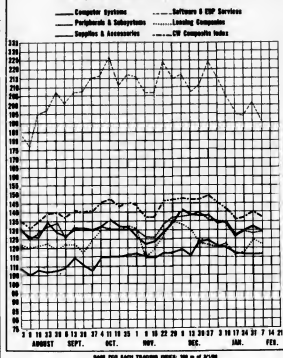
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NYSE	67 3/4	110-84	82	NYSE	21	69-48	67 1/2
NYSE	183 1/2	126-84	100 1/2	NYSE	29	61-39	27 1/2
NYSE	102	177-99	160 3/8	OTC	17 1/4	27-14	19 1/2
NYSE	19 1/4	101-81	82	NYSE	33 1/2	27-14	13 7/8
NYSE	67 1/4	100-81	82 3/4	NYSE	24 1/2	20-10	27 1/2
NYSE	60	91-51	61 3/4	OTC	10 1/2	10-10	14 3/4
NYSE	63 1/4	144-80	116 3/8	NYSE	25 1/2	15-12	22 1/2
NYSE	268 1/2	375-290	296 1/4	OTC	16 1/4	14-10	20 1/2
NYSE	100 7/8	140-80	111 1/2	NYSE	29	67-39	67 1/2
NYSE	46 7/8	83-64	64 1/8	OTC	26 5/8	20-10	18 1/2
NYSE	60	82-62	60 1/2	NYSE	18 7/8	10-10	11 3/8
NYSE	78 3/4	116-78	96 1/4	NYSE	57 1/2	108-84	84
NYSE	65	62-42	50 1/2	OTC	74	145-71	71 1/2
NYSE	22 1/2	20-20	20 1/2	NYSE	25 1/2	18-12	26 1/2
				OTC	40 1/4	38-12	34 1/2
				NYSE	18	29-14	28 1/2
				NYSE	40 1/4	38-12	34 1/2
				NYSE	47	120-93	93
				OTC	40 1/2	31-32	34 1/2
				NYSE	24 1/2	22-22	22 1/2
COMPUTER SYSTEMS				PERIPHERALS & SUBSYSTEMS			
EXCHANGE	BASE PRICE	1968-69 CLOSING	RANGE	EXCHANGE	BASE PRICE	1968-69 CLOSING	RANGE
NYSE	183 1/8	183-187	182 1/2	OTC	33 5/8	31-33	33
NYSE	67 3/4	110-84	82	NYSE	21	69-48	67 1/2
NYSE	183 1/2	126-84	100 1/2	NYSE	29	61-39	27 1/2
NYSE	102	177-99	160 3/8	OTC	17 1/4	27-14	19 1/2
NYSE	19 1/4	101-81	82	NYSE	33 1/2	27-14	13 7/8
NYSE	67 1/4	100-81	82 3/4	NYSE	24 1/2	20-10	27 1/2
NYSE	60	91-51	61 3/4	OTC	10 1/2	10-10	14 3/4
NYSE	63 1/4	144-80	116 3/8	NYSE	25 1/2	15-12	22 1/2
NYSE	268 1/2	375-290	296 1/4	OTC	16 1/4	14-10	20 1/2
NYSE	100 7/8	140-80	111 1/2	NYSE	29	67-39	67 1/2
NYSE	46 7/8	83-64	64 1/8	OTC	26 5/8	20-10	18 1/2
NYSE	60	82-62	60 1/2	NYSE	18 7/8	10-10	11 3/8
NYSE	78 3/4	116-78	96 1/4	NYSE	57 1/2	108-84	84
NYSE	65	62-42	50 1/2	OTC	74	145-71	71 1/2
NYSE	22 1/2	20-20	20 1/2	NYSE	25 1/2	18-12	26 1/2
				OTC	40 1/4	38-12	34 1/2
				NYSE	18	29-14	28 1/2
				NYSE	40 1/4	38-12	34 1/2
				NYSE	47	120-93	93
				OTC	40 1/2	31-32	34 1/2
				NYSE	24 1/2	22-22	22 1/2

Computer Stocks Trading Index



Composite Down 1.5%

Software Drops by 4.3%, Two Others Down 1.5%

Stock trading continued to be unimpressive during the week ended Jan. 31, while the *Computerworld* composite stock index dropped about 2.2 points (1.5%).

The Dow Jones industrial average rose only slightly, by 0.8%, during the same period.

No individual *Computerworld* sector had the strength to gain more than 1 point, but the Peripherals & Subsystems sector did rise 0.73% (0.57%) to 129.4, and Supplies & Accessories

squeaked by with a gain of 0.13% (0.12%) to 117.

Software & EDP Services developed the composite index by dropping 9.77 (4.3%) to 191.6.

Computer Systems lost 2.02 (1.5%) ending at 129.7, and Leasing Companies lost 1.85 (1.5%) ending at 122.1.

During the same week, *Stantec* & *Poor's* industrial index nudged up 0.39%, the American Stock Exchange price index was up 0.21%, and the New York Stock Exchange composite index was up 0.48%.

Losers outnumbered gainers on the *Computerworld* Trading Summary 58 to 36.

Computer Systems

The Computer Systems section lost most of the previous week's gain with only four stocks registering small gains and 12 with small losses.

Scientific Controls held the highest gain of 2-1/2 (6.76%). Collins Radio, down 4 (6.06%) and Digital Equipment, down 3-1/4 (5.44%) were the biggest losers.

Old job customers' purchases and sales for the week showed that the old orders were buying

Peripherals

The Peripherals & Subsystems sector, the week's weak leader, was supported by the gains of Tally, up 2 (6.35%); and Recognition Equipment, up 5-1/2 (8.15%).

Losers were marked, however, by Alphametric, down 6 (9.45%); Photon, down 2-1/4 (7.83%); and Information Displays, down 1-1/2 (7.14%).

In the Supplies & Accessories Sector there were no percentage changes greater than the 4.76% (2.1%) gain of Reynolds & Reynolds.

Software & EDP Services

The Software & EDP Services sector lost heavily. Leading in the loss accumulation were: Applied Data Research, down 19-1/2 (57.35%); United Data Centers, down 3 (25.53%); Aries, down 2 (10.53%); and Computer Network, down 6 (10.91%).

Sizeable gains occurred with Electronic Computer Programming Institute, up 4-3/8 (12.31%); and Applied Systems, up 1-1/4 (8.20%).

Leasing

System Capital, down 18-1/2 (35.92%), was the largest and only loser over 10% in the Leasing sector. Management Assistance was next in line, down 1-1/2 (8.55%).

Booth Computer, 4 (2.60%), and Levin-Townsend Computer, up 1-7/8 (3.57%) were high gainers.

— Since 10/15/68 *Companies included in *Computerworld's* stock trading index for each sector.

orders and installations



First Federal Savings of Detroit has ordered an \$800,000 system of electronic teller machines from Bunker-Ramo Corp. The 63 terminals will enable all tellers at all offices to use a central computer for instant processing of transactions and will provide management with current status reports of ledger and cash positions. Delivery is scheduled for late 1969.

Applied Data Research, Inc. has installed an IBM 360/50 in its new Princeton, N.J. headquarters and computer center. The system will be used to de-

velop proprietary software programs and on a service bureau basis for outside business accounts.

International Telecomputer Network Corp., Bethesda, Md., has installed a GE-635 time sharing information system. The new system is in addition to a GE-635 presently in use.

Pan American Petroleum Corp., Tulsa, Okla. has ordered from Precision Instrument Co., a Unicon laser mass memory system to be used with IBM 360/65 or 360/75 computers for mass memory application. Installation is scheduled for 1970.

The Federal Aviation Administration has received 10 Vector Analog Computers from Suller National Corp. on a lease/purchase agreement, to be installed in ten aircraft. The systems will be used by the FAA to develop new procedures and criteria for air navigation leading to im-

provements in the federal air traffic control system. The University of Wisconsin, Madison, has installed a remote batch processing terminal developed by Digital Logic Corp., Anaheim, Calif. The terminal is located at the university's Univac 1108 computing system and is used to perform data processing from a remote location.

Applied Industrial Dynamics, Inc., Seattle, Wash. has installed a Control Data 3150 computer system to provide service to its customers in the Pacific northwest.

Charterhouse, Japhet & Thomason, London, England, has ordered an NCR Century 100 computer system for installation in August. The computer will be used by the bank's investment management department.

The Murray B. Marsh Co., Los Angeles, Calif., has installed a Burroughs 8500 computer system to handle accounting and inventory control for the firm's 11 warehouses serving customers in 13 western states.

Colorado State University, Canon City, Calif. has ordered a Redcor 685 data acquisition system to be used for reducing analog data gathered from experiments being conducted at the university. Delivery is scheduled for February.

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Earnings	\$3,147,089	\$5,005,321
Shr End	143.347	202.096
	-.31	-.43

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Six Months Ended Dec. 31

Revenue	1967	1968
Earnings	\$64,901,671	\$63,149,141
Shr End	2,725.342	1,681.671
	-.61	-.44

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APPLICATIONS, INC.

Year Ended Sept. 30

Revenue	\$26,261,000	\$42,831,000
Earnings	\$56,000	\$76,000
Shr End	-.44	-.40

e=includes results on pooling of interests basis.

BOOTHIE COMPUTER CORP.

Year Ended Dec. 31

Revenue	\$1967	1968
Earnings	\$336,678	\$18,225,182
Shr End	(176,608)	1,602,934
	-.31	-.96

e=July 10, 1967 to Dec. 31, 1967. b=includes extraordinary income.

NUCLEAR DATA

9 Months Ended Nov. 30

Revenue	\$3,346,745	\$4,626,157
Earnings	202,129	360,383
Shr End	-.38	-.63

e=Based on weighted average number of shares outstanding adjusted for residual security.

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